PREFACE

A variety of human activities, ranging from agricultural practices to mining and construction of highways and urban areas, have impacted our physical environment increasingly in the past 20 to 30 years. The International Commission on Continental Erosion (ICCE) has organized or participated in several symposia and workshops in recent years on various aspects of erosion, sedimentation, sediment yield and techniques for measurement and analysis of data from field investigations and experiments. This symposium was organized to consider the problems associated with sediment in our physical environment. The papers in this volume are divided into four categories: (1) sediment-associated transport of contaminants in nonpoint pollution and impacts on hydrologic systems; (2) erosion control for mining, construction, and waste disposal activities; (3) time lag in the movement of sediments through drainage networks; and (4) modelling of agricultural runoff pollution and physical habitat simulation.

The category of papers dealing with nonpoint sources of pollution considers a wide variety of problems. The transport of pollutants from nonpoint sources is associated predominantly with the fine fraction of mineral and organic sediment load during the runoff process. The results of studies on agricultural fields show that sediment can be important in the transport of soluble herbicides from the site of application. In a paper from midwestern USA, nitrogen and phosphorus losses from simulated rainfall were measured from five tillage systems. Tillage treatment and contouring significantly affected runoff, soil loss, and nutrient loss. Sediment transport processes are also examined from the aspect of disturbance caused by mining operations. Arsenic concentrations in overbank deposits record the dilution of transported mine tailings by uncontaminated alluvium during overbank flow. These observations were made on the Belle Fourche River, South Dakota, USA. Similarly, in the River Geul basin of The Netherlands past mining activities have severely polluted floodplain soils with heavy metals. As observed in the Belle Fourche River, there is a downstream exponential decay of metal concentrations due to dilution by relatively clean bed, bank, and hillslope sediment.

Another aspect of nonpoint pollution that has attracted much interest recently is the fallout of radionuclides from the Chernobyl reactor accident in 1986. Over the United Kingdom measurements indicate a marked spatial variation. Measurements of caesium-137 content of suspended sediment in the River Severn, and channel and floodplain sediment collected within the river basin were used to assess the role of fluvial transport in distribution of the radionuclides.

A further complication to the problem of assessing pollution associated with sediment transport is discussed in a paper on samplers. Sampling and subsequent physical and chemical analyses of suspended sediment from various locations in the USA indicates substantial differences in sediment concentrations and some trace elements depending on the type of sampler used--depth-integrated, point, or pumping sampler.

In papers on erosion control, a paper from China considers the large sediment load of the Yellow River basin, and the associated problems of soil erosion and reservoir sedimentation. A paper from South Africa discusses the soil erosion and reservoir sedimentation problems from the standpoint of cost impacts using an average storage loss of 0.35 percent per year. Reduction of soil losses and reservoir capacity on disturbed lands can be managed if landscapes are properly designed during reclamation phases. The goal in design of a landscape is re-establishment of dynamic equilibrium within the geomorphic system disturbed.

In three papers from widely separated locations, the processes of long- and short-term storage of sediment and impacts on the hydrologic system are considered. In southwestern Wisconsin and northwestern Illinois in the USA, the use of lead and zinc trace metals associated with historical mining shows that historical rates of overbank flood plain sedimentation range from about 0.3 cm $year^{-1}$ to 4.0-5.0 cm yr^{-1}. These rates greatly exceed the average presettlement rate of 0.02 cm yr^{-1}. In the Southern High Plains of Texas most runoff and water-entrained sediment collect in playa lakes. Measured thicknesses and carbon-isotope analyses of playa sediment indicate calculated rates of deposition up to 0.48 m per 1,000 years. Measured Beryllium-ten (^{10}Be) concentrations with depth provide estimates of playa age, and suggests that those playas studied developed in late Pleistocene time. In a study of a gravel-bed river in New Zealand the extent to which bed material is stored in wide gravel river beds was addressed and described as being related to the variation of event magnitude and sediment characteristics.

Modelling of agricultural runoff pollution, because of the scope and complexity of the issues involved, is best approached by use of computer models. Such models would be viewed as one of the components in an integrated system of models used in river basin management and their main function is to provide loading inputs to water quality models. The paper in this volume provides an excellent overview of the modelling process. A second modelling paper considers simulation of physical habitat and instream flow requirements for aquatic species.

This symposium addresses many of the problems that are encountered in our physical environment related to erosion and sedimentation. It is apparent that many problems are still a long way from satisfactory answers. It is, however, gratifying to find that the scientific community has made so much progress in recent years.

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